Dr. Hannan E. LaGarry
55 Whispering Pines
Chadron NE 69337

June 19, 2017

BY EMAIL
Valois Shea (shea.valois@epa.gov)
U.S. EPA Region 8
Mail Code: 8WP-SUI
1595 Wynkoop Street
Denver CO 80202-1129

Re: SUPPLEMENTAL WRITTEN TESTIMONY on the potential adverse effects of the proposed Powertech/Dewey-Burdock project.

Dear Sir or Madam:

The undersigned, Dr. Hannan E. LaGarry, an individual, residing at 55 Whispering Pines, Chadron NE 69337, hereby provide the following SUPPLEMENTAL WRITTEN TESTIMONY to the above-referenced draft permits and documents related to Powertech/Dewey-Burdock. These written comments are provided in addition to the written testimony provided at the original hearing in Hot Springs SD on 10 May 2017.

Introduction

I have served as an expert witness for uranium intervenors since 2008, and have provided numerous expert written expert testimonies for both the Crow Butte Resources (CAMECO) and Dewey-Burdock (POWERTECH/AZARGA) ISL uranium license interventions. I am a stratigrapher and geologic mapper with 30 years of experience working in the geology of SW South Dakota and adjacent NW Nebraska. A copy of my CV is attached at the end of this testimony to establish my credentials in this proceeding.

In my initial testimony I provided the data we recovered from our examination of Powertech's belatedly disclosed borehole data purchased from the Tennessee Valley Authority (TVA). Within this data we observed that the drillers of the TVA boreholes documented uncased holes, improperly plugged holes, artesian water, breccia pipes and caves, and faults. In my expert opinion, secondary porosities in the Dewey-Burdock area are such that loss of containment and the escape of pressurized fluids from underground waste injection are almost a certainty should either mining or injection be allowed. In this document, I will briefly outline my concerns with respect to this inevitable loss of containment: existing flow direction and water quality within the Minnelusa Aquifer.

Flow Direction in the Minnelusa Aquifer

During the hearings there was much discussion about whether or not groundwater within the Minnelusa Aquifer flowed west, east, or not at all. Based on groundwater flow mapping by the United States Geological Survey (Driscoll and others 2002), water in the vicinity of the Dewey-Burdock site flows S/SE along the southern edge of the Black Hills, and once into greater Fall River County, groundwater flow is due east (Figure 70 – black arrow showing dominant flow direction was added by me). This report makes no mention of a groundwater divide or other circumstance that would indicate isolation of groundwater within the Dewey-Burdock vicinity.

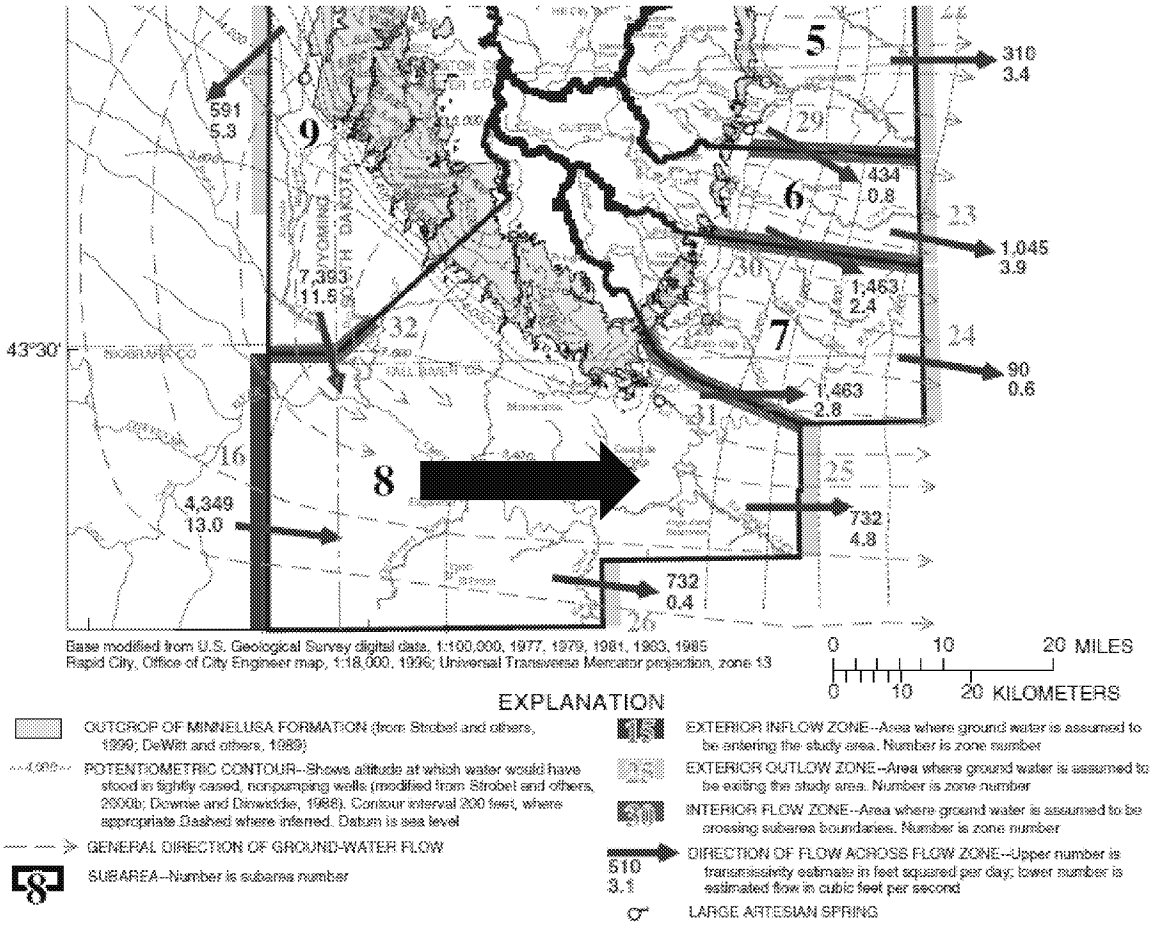

Figure 70. Subareas, generalized ground-water flow directions, and flow zones for the Minnelusa aquifer. Estimated transmissivities and flow components for flow zones also are shown (from Carter, Driscoll, Hamade, and Jarrell, 2001).

Figure 70 shows that while groundwater flow north of Dewey-Burdock may initially be to the SW into Wyoming, this flow path quickly corrects to southward and then eastward flow. The flow from north of Dewey-Burdock to the SW has been measured at 591 feet/day, but flow south of the site has been measured at 7,393 feet/day. Once eastward flow is established, its been measured at 4,349 feet/day to the east at the SD-WY state line, then 1,463 feet/day to the east in northern Fall River County and 732 feet/day to the east in central and southern Fall River County. On average, flow from Dewey-Burdock towards Edgemont, Hot Springs, Buffalo Gap,

Oelrichs, and the western border of the Pine Ridge Reservation is about 3,484 feet/day. The Pine Ridge Reservation (Oglala Lakota County) is 46 miles from the Dewy-Burdock site, which means contaminated water from Dewey-Burdock could travel to the Pine Ridge Reservation in 70 days. Edgemont would be affected in weeks, and Hot Springs would be reached in as little as 35 days.

Water Quality in the Minnelusa Aquifer

I've attached a recent groundwater test from Minnelusa Aquifer from the Hot Springs area (see following pages). Based on EPA's criteria for aquifer exemptions:

§146.4 Criteria for exempted aquifers.

An aquifer or a portion thereof which meets the criteria for an "underground source of drinking water" in §146.3 may be determined under §144.7 of this chapter to be an "exempted aquifer" for Class I-V wells if it meets the criteria in paragraphs (a) through (c) of this section. Class VI wells must meet the criteria under paragraph (d) of this section:

(a) It does not currently serve as a source of drinking water; and

(b) It cannot now and will not in the future serve as a source of drinking water because:

(1) It is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible.

(2) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical;

(3) It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or

(4) It is located over a Class III well mining area subject to subsidence or catastrophic collapse; or

(c) The total dissolved solids content of the ground water is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.

(d) The areal extent of an aquifer exemption for a Class II enhanced oil recovery or enhanced gas recovery well may be expanded for the exclusive purpose of Class VI injection for geologic sequestration under §144.7(d) of this chapter if it meets the following criteria:

(1) It does not currently serve as a source of drinking water; and

(2) The total dissolved solids content of the ground water is more than 3,000 mg/l and less than 10,000 mg/l; and

(3) It is not reasonably expected to supply a public water system.

(Clean Water Act, Safe Drinking Water Act, Clean Air Act, Resource Conservation and Recovery Act: 42 U.S.C. 6905, 6912, 6925, 6927, 6974)

[45 FR 42500, June 24, 1980, as amended at 47 FR 4998, Feb. 3, 1982; 48 FR 14293, Apr. 1, 1983; 75 FR 77291, Dec. 10, 2010]

The attached water test shows TDS and U levels below the secondary maximum contaminant levels established by EPA for potable drinking water. Based on these standards, the Minnelusa Aquifer sampled in this case is a valid source of drinking water, and, given that the USGS document cited earlier does not recognized barriers to water flow within the aquifer, the Minnelusa Aquifer is ineligible for an aquifer exemption, and this residents potable water supply may be jeopardized by uncontained injected waste.

Concluding Remarks

If the injection permits are allowed to forward, its very likely that there will be leaks, and contaminants will adversely affect drinking water supplies in Fall River County

References

Driscoll, D. G., J. M. Carter, J. E. Williamson, and L. D. Putnam. 2002. Hydrology of the Black Hills Area, South Dakota. United States Geological Survey Water-Resources Report 02-4094, 150 pp.

Signature

The information contained herein is true and correct to the best of my knowledge at the time of this writing on 19 June 2017.

Dr. Hannan E. LaGarry
55 Whispering Pines
Chadron NE 69337

MIDCONTINENT
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709
(605) 348-0111 – www.thechemistrylab.com

Sample Site: Acter 605-745-6366
Project Name: Dewey Burdoc / Hot Springs
Sampled: 06/14/17 at 01:45 PM by Linsey McLean
Sample Matrix: Water

LINSEY MCLEAN
COUNCIL FOR RESPONSIBLE MINING
840 HUSKER PL
RAPID CITY, SD 57701

Lab ID#: 20170615207
Received: 06/15/17 at 08:00 AM by Dean Aurand
Account: 8766 - Council for Responsible Mining

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
Physical Properties							
Total Dissolved Solids	223	mg/L	100ml	18.1	50.0	SM 2540 C	ELR 06/15/17
Non-Metallics							
Nitrogen, Nitrate (NO3)	0.471	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL 06/16/17
Sulfate (SO4)	31.4	mg/L	1	0.531	1.00	SM 4500-SO4 E	BLL 06/16/17
Metals - Total							
Antimony (Sb)	< 0.005	mg/L	10	0.00024	0.005	EPA 200.8	TNA 06/16/17
Arsenic (As)	0.014	mg/L	10	0.00047	0.005	EPA 200.8	TNA 06/16/17
Barium (Ba)	0.053	mg/L	10	0.00029	0.005	EPA 200.8	TNA 06/16/17
Beryllium (Be)	< 0.001	mg/L	10	0.00018	0.001	EPA 200.8	TNA 06/16/17
Cadmium (Cd)	< 0.001	mg/L	10	0.000025	0.001	EPA 200.8	TNA 06/16/17
Chromium (Cr)	0.001	mg/L	10	0.000025	0.001	EPA 200.8 DRC	TNA 06/16/17
Copper (Cu)	0.007	mg/L	10	0.00017	0.005	EPA 200.8	TNA 06/16/17
Lead (Pb)	< 0.001	mg/L	10	0.000024	0.001	EPA 200.8	TNA 06/16/17
Mercury (Hg)	< 0.0002	mg/L	1	0.000035	0.0002	EPA 245.1	TMS 06/16/17
Nickel (Ni)	< 0.005	mg/L	10	0.00007	0.005	EPA 200.8	TNA 06/16/17
Selenium (Se)	0.016	mg/L	10	0.001	0.005	EPA 200.8	TNA 06/16/17
Silver (Ag)	< 0.001	mg/L	10	0.00014	0.001	EPA 200.8	TNA 06/16/17
Thallium (Tl)	< 0.001	mg/L	10	0.00009	0.001	EPA 200.8	TNA 06/16/17
Uranium (U)	0.010	mg/L	10	0.000022	0.001	EPA 200.8	TNA 06/15/17
Zinc (Zn)	< 0.050	mg/L	10	0.002	0.050	EPA 200.8	TNA 06/16/17

Quality Control Data

Parameter	Result	Limits	DF	Method	Analyst/Date
Total Metals - Internal Std					
Bismuth (Bi)	81.5 %	(60.0 - 125.0) %	10	EPA 200.8	TNA 06/15/17
Bismuth (Bi)	91.2 %	(60.0 - 125.0) %	10	EPA 200.8	TNA 06/16/17
Germanium (Ge72)	93.2 %	(60.0 - 125.0) %	10	EPA 200.8	TNA 06/16/17
Germanium (Ge74)	94.5 %	(60.0 - 125.0) %	10	EPA 200.8 DRC	TNA 06/16/17
Indium (In)	93.9 %	(60.0 - 125.0) %	10	EPA 200.8	TNA 06/16/17
Lithium (Li)	97.5 %	(60.0 - 125.0) %	10	EPA 200.8	TNA 06/16/17
Scandium (Sc)	96.1 %	(60.0 - 125.0) %	10	EPA 200.8	TNA 06/16/17

Report Approved By:

Dean Aurand

Report Approved On: 6/16/2017 5:01:35 PM